CLAIMS

1. A system for heating optical members, the system comprising:

a thermally-conductive inner housing defining an interior volume for receiving an optical member to be heated;

a thermally-insulative outer housing at least partially containing the thermally-conductive inner housing; and

a heating structure disposed outside the inner housing and configured to provide heat through the thermally-conductive inner housing and into the interior volume defined by the inner housing.

2. The system of claim 1 wherein the inner housing is configured such that an inner surface defining the interior volume has a substantially uniform temperature in response to the inner housing receiving the heat provided by the heating structure.

3. The system of claim 2 wherein the inner housing is configured to define the interior volume to be axi-symmetric.

4. The system of claim 1 further comprising a controller coupled to the heating structure and configured to control the heating structure such that the member disposed in the interior volume is heated substantially without being plastically deformed.

5. The system of claim 4 wherein the controller is configured to control the heating structure such that a resolved shear stress of a CaF_2 optical member disposed in the interior volume does not exceed about $0.5e^{(990/T)}$ MPa where T is average temperature of the member in Kelvin.

6. The system of claim 1 wherein a portion of the outer housing in contact with and supporting the inner housing has a thermal conductivity different than at least one other portion of the outer housing.

7. The system of claim 1 wherein an inner boundary of the outer housing is disposed in contact with substantially an entire outer boundary of the inner housing.

8. The system of claim 7 wherein the inner housing and at least a portion of the outer housing are an integral structure, with the inner housing and the at least a portion of the outer housing being layers of the integral structure with different thermal conductivity.

9. The system of claim 1 wherein the inner housing comprises at least one of high-thermal-conductivity graphite and high-thermal-conductivity carbon.

10. The system of claim 9 wherein the interior volume is cylindrical and directions of highest thermal conductivity of the inner housing are parallel with inner surfaces of the inner housing.

11. The system of claim 9 wherein the interior volume is cylindrical and directions of lowest thermal conductivity of the inner housing are perpendicular with inner surfaces of the inner housing.

12. The system of claim 9 wherein directions of lowest thermal conductivity of the outer housing are perpendicular with outer surfaces of the inner housing.

13. The system of claim 1 wherein the inner housing has substantially orthotropic thermal conductivity.

14. The system of claim 1 wherein the outer housing comprises at least one of low-thermal-conductivity graphite, low-thermal-conductivity carbon, low-thermal-conductivity porous graphite, low-thermal-conductivity porous carbon, low-thermal-conductivity fibrous graphite, low-thermal-conductivity fibrous carbon.

15. The system of claim 1 wherein the outer housing has substantially orthotropic thermal conductivity.

16. The system of claim 1 further comprising another thermally-conductive housing, the another thermally-conductive housing substantially contains the thermally-insulative outer housing.

17. The system of claim 16 wherein the another thermally-conductive housing is displaced from the outer housing.

18. The system of claim 1 wherein the inner housing defines a plurality of interior volumes each for receiving an optical member to be heated.

19. The system of claim 1 wherein the inner housing has a substantially isotropic thermal conductivity.

20. The system of claim 1 wherein the outer housing has a substantially isotropic thermal conductivity.

21. The system of claim 1 wherein at least a portion of the heating structure is disposed outside the outer housing.

22. A method of heating an optical member, the method comprising:

providing the optical member;

directing heat from a heat source toward the optical member; and

distributing the heat about the optical member through a high-thermal-conductivity apparatus disposed between the heat source and the optical member such that a surface of the apparatus defining a volume for receiving the optical member will have a substantially uniform temperature.

23. The method of claim 22 wherein the heat is distributed such that temperatures of the surface of the apparatus defining the volume vary by no more than about 0.5 K where K is temperature in Kelvin.

24. The method of claim 22 further comprising measuring at least one indication of temperature of the apparatus defining the volume.

25. The method of claim 24 wherein the at least one indication includes a plurality of indicia of temperature of the apparatus, the indicia being related to at least one of an outer surface, an inner surface, and an interior of the apparatus.

26. The method of claim 24 further comprising adjusting how much heat is directed toward the optical member in accordance with the at least one indication.

27. The method of claim 26 wherein the adjusting is in accordance with a model of temperature variations within the optical member.

28. The method of claim 26 wherein how much heat is directed toward the optical member is adjusted to guard against stress within the optical member exceeding a critical resolved shear stress of the optical member during at least one of annealing of the optical member and cool down of the optical member.

29. The method of claim 22 further comprising inhibiting heat from transferring away from the optical member from the high-thermal-conductivity apparatus.

30. The method of claim 22 wherein a plurality of optical members is provided, wherein heat is directed from a heat source toward each of the optical members, and wherein the heat is distributed about each of the optical members through the high-thermal-conductivity apparatus disposed between the heat source and the optical members such that surfaces of the apparatus defining volumes for receiving the optical members will each have a substantially uniform temperature.

31. A system for annealing at least one single crystal blank for use as at least one optical lens, the system comprising:

a heating structure for supplying heat; and

heating means for heating the at least one single crystal blank, using the heat from the heating structure, to an annealing temperature of the blank and for cooling the at least one single crystal blank from the annealing temperature to an ambient temperature substantially without plastic deformations developing in the at least one blank, the heating means including at least a high-thermal-conductivity housing for containing the at least one single crystal blank.

32. The system of claim 31 wherein the heating means further includes an insulator structure at least partially containing the high-thermal-conductivity housing.

33. The system of claim 32 wherein the heating means further includes a controller coupled to the heating structure for regulating heat provided by the heating structure to permit annealing of the at least one blank while inhibiting temperature gradients inside the at least one blank from producing plastic deformations.

34. The system of claim 33 wherein the heating means further comprises temperature sensors coupled to the controller configured to provide indicia of temperatures of the high-thermal-conductivity housing to the controller and wherein the controller regulates the heat provided by the heating structure in response to the indicia provided by the temperature sensors.

35. The system of claim 33 wherein the controller inhibits temperature gradients inside each of the at least one blank from producing stresses in excess of about $0.5e^{(990/T)}$ MPa where T is average temperature of each blank in Kelvin.

36. An optical member comprising a single crystal material substantially free of residual stress and having an optical birefringence of less than about 1 nm/cm.

37. The optical member of claim 36 wherein the single crystal material forms an optical lens blank.

38. The optical member of claim 36 wherein the single crystal material is a fluoride.

39. The optical member of claim 38 wherein the single crystal material is CaF_2.